

REMARKS

The rejection of Claims 7, 14 and 17 under 35 U.S.C. § 103(a) as unpatentable over JP 2000-235868 (JP '868) in view of JP 04-190560 (JP '560), respectfully traversed.

JP '868 has been relied on for a disclosure of a lithium secondary battery containing a nonaqueous solvent, which solvent contains γ -butyrolactone in an amount of from 50-95 vol.%, as well as the disclosure of a lithium cobalt oxide as a positive active material [0023], polyvinylidene fluoride as a binder therefor [0025] and a second sheathing material of thickness 0.05-0.3 mm, and more desirably 0.08-0.15 mm [0066]. The Examiner concedes that JP '868 does not disclose a lithium cobalt oxide containing an amount of Nb therein.

The Examiner thus relies on JP '560.

JP '560 discloses a particular positive electrode active material for a lithium secondary battery which has the formula $\text{Li}_x(\text{Co}_{1-y}\text{M}_y)\text{O}_2$, wherein $x=0$ to 2, $y=0.001$ to 0.4 and M is an element or elements of the group including at least Nb or Ta. The range of M concentration relative to Co is thus very broad, as now discussed.

When $y = 0.001$ (and $1-y = 0.999$), the amount of M relative to Co is $0.001/0.999$, or 0.001, or 0.1 at %; when $y=0.4$ (and $1-y=0.6$), the amount of M relative to Co is $0.4/0.6$, or 0.667, or 67 at%. Thus, JP '560 discloses the Nb amount of from 0.1 at% to 67 at%, relative to Co.

JP '560 discloses the following Examples and Comparative Examples in Table 1 therein, reproduced below with an added column showing relative amount of Nb to Co, where applicable:

battery	positive material form	charge-discharge capacity before storage (Wh/kg)	charge-discharge capacity after storage on 60°C for 7 days (Wh/kg)	the amount of Nb relative to Co
Example 1	$\text{Li}(\text{Co}_{0.95}\text{Nb}_{0.05})\text{O}_2$	460	295	5.2 at%
Example 2	$\text{Li}(\text{Co}_{0.9}\text{Nb}_{0.1})\text{O}_2$	457	294	11.1 at%
Example 3	$\text{Li}(\text{Co}_{0.7}\text{Nb}_{0.3})\text{O}_2$	452	281	42.9 at%
Example 4	$\text{Li}(\text{Co}_{0.95}\text{Ta}_{0.05})\text{O}_2$	461	264	-
Example 5	$\text{Li}(\text{Co}_{0.9}\text{Ta}_{0.1})\text{O}_2$	455	263	-
Example 6	$\text{Li}(\text{Co}_{0.7}\text{Ta}_{0.3})\text{O}_2$	446	246	-
Example 7	$\text{Li}(\text{Co}_{0.9}\text{Nb}_{0.05}\text{Y}_{0.05})\text{O}_2$	455	295	5.6 at%
Example 8	$\text{Li}(\text{Co}_{0.9}\text{Nb}_{0.05}\text{Ce}_{0.05})\text{O}_2$	460	265	5.6 at%
Comparative Ex. 1	LiCoO_2	461	0	-
Comparative Ex. 2	$\text{Li}(\text{Co}_{0.9}\text{Fe}_{0.2})\text{O}_2$	458	80	-

Claim 7, on the other hand, recites an amount of Nb relative to Co of 0.001 to 2 at%.

Clearly, based on the examples of JP '560, it would not be expected that any benefit would be obtained by operating within the present Nb range of 0.001 to 2 at%.

In addition, Table 2 at page 30 of the specification herein shows that when the amount of Nb relative to Co is 10 at% (Comparative Ex. 2), the capacity is poor. Similarly, in JP '560, batteries having an Nb amount relative to Co of 5.2 at% and 11.1 at% (Examples 1 and 2, respectively) have almost the same capacity. Thus, the recited range for Nb of 0.001 to 2 at % relative to Co produces unexpectedly better capacity as disclosed in Table 2. Compare the results for Comp. Example 2 with Examples 1 and 5-10.

In sum, based on the above-discussed data in JP '560, and particularly Examples 1-3 and 7-8 therein, which are drawn to an Nb-containing lithium cobalt oxide, one skilled in the art could not have expected that using Nb in the relatively smaller amounts herein would have any beneficial effect on electrical properties.

New Claims 18-20 are separately patentable. Compare the data in Table 2 for Examples 1, 5 and 6, which are within the terms of these claims and which have a greater 1C capacity than Examples 7 and 8, and Comparative Examples 1 and 2, which are outside the terms of these claims, and which differ from the inventive examples only by using an amount of Nb outside the recited range in these claims. Clearly, one of ordinary skill in the art could not have predicted these results from JP '560.

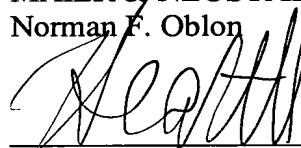
For all the above reasons, it is respectfully requested that this rejection be withdrawn.

Applicants respectfully submit that all of the presently-pending claims in this application are now in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

Respectfully submitted,

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